

WATERSHED MODEL

Grades 3-12	Location Inside or Outside
Group Size ~ 6-30 children	Length 45 minutes-1.5 hours (or as part of a larger curriculum)
Materials <ul style="list-style-type: none">➤ Enviroscope Models (including pollutants/water bottles/buffers)➤ Learning Results➤ Assessment activities for each child➤ Teacher Evaluation Form➤ picture of algae bloom➤ example of soil	Classroom needs: <ul style="list-style-type: none">➤ Kids with enthusiasm➤ Black/white board➤ Table for each model➤ Water nearby (sink preferred for clean-up)



OVERVIEW &

OBJECTIVES

Each of us lives in a watershed. A

Watershed is all of the land that drains into a specific waterbody, which may include lakes, rivers and streams. After this presentation, students should be able to:

- understand vocabulary words that relate to water and watersheds (see glossary attached)
- relate why it is important to protect our water resources
- understand the basic concepts of the water cycle; **evaporation, precipitation** and condensation

- understand the concept of non-point source pollution and how human activities contribute to its effects
- explain actions we can take in our daily lives that will help promote clean water and reduce non-point source pollution

The watershed model presentation can be a fun, dynamic tool for your classroom. A thorough, inspiring presentation, combined with pre- and post-presentation supporting materials, can be an important component of your water science curriculum. This outline is intended to show the full range of activities and discussion that can be used with the watershed model presentation. It can be tailored to specific needs. Also, not all concepts are appropriate or necessary for all grade levels. The outline is a general guide to the presentation possibilities, NOT a list of what is covered at each presentation. Please ask about any specific items that fit or do not fit into your curriculum. Helpful feedback and suggestions are always appreciated!

PREPARATION for Outreach Educator

Before educator arrives

- send teachers information about model, including this guide and assessment tools

When educator arrives:

- Set up models in classroom (fill lake with water, insert trees, put pollutants near models)
- Write WATERSHED on the board. (and vocabulary words if you are playing Lingo Bingo)

INTRODUCTION (See Supplemental sheet: Introducing...the Watershed Model)

1. Hello and Welcome. I'm _____, an AmeriCorps volunteer working at _____.
2. Review simple Rules
 - a. Hand raising
 - b. Do not touch models until asked
 - c. Participation is Key!
3. Optional: Give pre-assessment tools which may include word search, bingo or 'How much do you know?' Quiz for familiarity with terms. (teacher may also give these beforehand)
4. Discuss Key Vocabulary Words
 - a. **Watershed** - What is it? (Using topographic maps for upper grades) Use cupped hands as a demo, or draw a picture on the board.
 - b. Water bodies – which lakes/rivers/streams/ponds are in the local watershed?
 - c. **Water cycle** (Options: Incredible Journey – Project WET, Water Wonders – Project WET)
 1. **evaporation**
 2. **precipitation**
 3. condensation
5. Why do we care about clean water? What do we use it for?
 - a. washing, cleaning, bathing
 - b. drinking
 - c. recreation
6. Has anyone seen a lake with lots of algae; a green, smelly lake? Show picture of bloom if available.
- Would we rather have 'clean & clear' water or dirty, green, smelly water?
7. What is **Pollution**? Write this word on board.
 - a. What do you think of when you hear "Water Pollution"? Or "What are some sources of water pollution?" write answers on board.
 1. **soil/erosion** (if they don't say this – prompt them with "What is the #1 pollutant to Maine lakes and rivers?") Introduce Phosphorus if age appropriate.
 2. toxins, chemicals
 3. oil, gas
 4. fertilizers
 5. pesticides
 6. Trash/litter (not actually a major pollutant to ME lakes and rivers)

Watershed Heroes can be done at this point. (see below)

***If time allows move on to NPS pollution now – otherwise move onto Watershed Model and go into more detail at model. Remind students to gather around model –standing if possible- and not to touch the model until asked.*

8. Now is the time to get into more detail
 - a. Point source pollution
 1. What is it? (ask the students, record answers)
 2. examples (industrial plant, Combined Sewage Overflow (CSO), storm drains)
 3. demonstrate on model
 - b. Non-point source pollution, a.k.a. *polluted stormwater/snowmelt runoff*
 1. what is it? (ask students, record answers)
 2. examples (i.e. where it comes from)
 3. why is runoff harmful?

- i. nutrients in the soil itself!! You may discuss **Phosphorus** with older age groups. (#1 cause of water quality problems in Maine! (Option: draw and discuss a simple lake food web)
 - ii. bacteria
 - iii. toxins
 - iv. turbidity
 - c. Discuss at-home activities that contribute to NPS pollution
 - 1. Chemicals: lawns, boat, car, household cleaners, paint thinners, etc.
 - 2. excessive water use
 - 3. septic tank failure
 - 4. pet wastes
 - 5. eroded soil on roads, driveways, ditches
 - d. Discuss what can be done to stop NPS pollution
 - 1. Vegetated buffers!
- Use Watershed HEROES to introduce this concept:
- ask for three volunteers
 - Have them come to the front of the room and explain that these three students will help our watershed out by being Watershed Heroes!
 - Choose the tallest student to be a tree. (student stands tall with arms outstretched)
 - Choose another student to be a shrub. (students kneels on one knee with arms out for branches)
 - The third student is asked to lie on the floor to be grass.
 - These three students are all **Buffers** or a **Buffer Strip**.
 - 2. fence animals out of water sources/contain manure
 - 3. reduce excessive clearing of land
 - 4. reduce excessive pesticide/fertilizer use
 - 5. maintain septic systems
 - 6. dispose of chemicals properly
 - 7. demonstrate buffers, fence, etc. on model

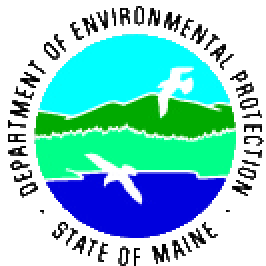
****THE MODEL**

1. Ask students what they observe on the model
 - a. Land use: farm, golf course, construction site, forest (logging area), parking lot, roads
 - b. Structures: houses, wastewater treatment plant, factory, barn
 - c. Animals, Cars/other vehicles, Lake, Stream
 - d. Well, stormdrain
 - e. Colors: Brown – soil, Green – grass, Gray – road/parking lot, Blue – Water, White – rocks
 - f. What does this model represent? A WATERSHED
2. What pollutants did they talk about earlier that could be represented on the model?
 - a. fertilizer (green Kool-Aid), pesticides (orange Kool-Aid), Soil (cocoa), oil/gas/manure (thick cocoa/water mixture)
 - b. have students sprinkle the above one at a time so every student is participating (*go back to NPS/Point Source Pollution if it wasn't covered earlier*)
 - c. Ask some questions:
 1. What do the students think about how the land looks after the pollutants are added?
 2. Does our watershed really look like this? Does this represent “real life?”
 3. How many students know if they use these things in their own homes?

3. Then it RAINS!
 - a. Hand out both water bottles and have each student spray 5-6 times (Rules for bottles may include: 1. spray down at the model, not across it; 2. limit number of sprays and then pass bottle to next student; 3. Spray on your side of the model, as pollutants may stain clothes)
 - b. Observe what happens to the lake as it rains and rains. (finish yourself if effect isn't complete)
4. Talk about the lake – What happened? Could this be an algae bloom?
5. Discuss home activities that contribute to NPS pollution
 - a. Chemicals: lawns, boat, car, household cleaners, paint thinners, etc.
 - b. excessive water use
 - c. septic tank failure
 - d. pet wastes
 - e. eroded soil on roads, driveways, ditches
6. Discuss what can be done to stop NPS pollution – what can we do?
 - a. Vegetated buffers! BMPs (Best Management Practices) (hand these out and have students place on model. Be creative – they will be!)
 - b. fence animals out of water sources/contain manure
7. Discuss other ways that this watershed could help out its lake
 - a. reduce excessive clearing of land
 - b. reduce excessive pesticide/fertilizer use
 - c. maintain septic systems
 - d. dispose of chemicals properly
 - e. the town could have better planned the land use areas
 - f. plant more buffers
 - g. talk with local lake associations/land planners about ways they could help

SUMMARY/REVIEW

1. Who polluted the water? (ask students!)
 - a. discuss "8 Simple Steps to Clean Water" brochure and poster together
2. Assessment - Whad'ya learn?
 - a. Familiarity quiz: How much do you know *now*?
 - b. Worksheets: "Find the Problem" search, Watershed Scramble, Watershed Word Search, What's wrong with this picture? Activity (US. EPA)
 - c. Lingo Bingo
 - d. Postcards ("Your neighbor, Mr. Rogers, wants to cut down all the trees on his lakefront property to get a better view of the lake. He asks you for advice – what will you tell him?")
 - e. Rainy Day Hike (Project WET)
 - f. Journaling (as part of existing journals, if they use journaling as part of their class evaluation)



USE WATER WISELY!



Designed by Nancy Olmsted, Maine DEP/AmeriCorps Educator 1999.
Adapted by Cameron Parker and Jessica Lincoln, Maine DEP/AmeriCorps Educators 2002.

WATERSHED MODEL GLOSSARY

ALGAE – tiny, floating plants that use photosynthesis to create food and oxygen.

ALGAE/ALGAL BLOOM – excessive growth of algae caused by too much nutrient input

BACTERIA – microscopic organisms that can be harmful when released into the water

BEST MANAGEMENT PRACTICE (BMP) – Practices that are put in place to help reduce NPS pollutant loads into a water body. OR, practical solutions that are put in place to help to prevent or stop potential or existing NPS pollution problems.

BUFFER/BUFFER STRIP – a strip or group of plants located downslope of potential runoff. These can filter runoff and absorb nutrients

EROSION – the gradual wearing down of land by water, wind or snowmelt

EVAPORATION – the process by which water becomes vapor in the atmosphere

FOOD CHAIN – shows how different organisms (plants & animals) relate to each other

GROUNDWATER – the water beneath the surface of the ground. Water in springs or wells

LAND USE – activities occurring on a particular area surrounding a water body. Land use can include but isn't limited to urban, agriculture, industry, forestry, and mining.

NON-POINT SOURCE POLLUTION (NPS) – pollution that originates from many different sources that often result from everyday human activities like gardening and lawn care, pesticide use, improper septic system maintenance, construction, etc. As it flows over the land, it picks up pollutants and deposits them into a body of water.

NUTRIENT – an element that serves as food or provides nourishment to plants or animals

OXYGEN – a gas that fish and other animals need in order to survive. In lakes it is found in high concentration in the coldest deepest water.

PHOSPHORUS – a nutrient attached to soil particles. It can cause algae blooms when it gets into lakes in large amounts.

POINT-SOURCE POLLUTION – pollution that enters water from a specific source such as factories or treatment facilities.

PRECIPITATION – another word for rain, hail, sleet or snow

RUNOFF – water that flows across the land's surface, does not soak into the ground, and eventually runs into bodies of water

SEDIMENT – the material suspended in or carried by water that settles out when the water slows down (may be nutrients or dirt/soil)

SOIL – the number one pollutant to Maine's lakes and rivers. May also be called DIRT.

SURFACE WATER – water that is on the surface of the earth (in lakes, streams, rivers, oceans, etc.)

WATERSHED – the land area from which all water drains from the land into a common water body